Section 4 – Sidewalks

(A) Intent: Sidewalks are encouraged in areas of moderate to high pedestrian activity along public and private rights-of-way, particularly within and between the following areas:

1. High employment
2. Commercial (service) areas
3. Dense residential areas (multifamily and small-lot, single-family residential subdivisions)
4. Public facilities (schools, libraries, parks, recreational centers)

(B) General standards (refer to current VDOT standards[a], as amended, for additional standards and detail)

1. Materials:
    a. Concrete which may be stamped and colored; or
    b. Solid paving units such as brick or concrete.
2. Sidewalk depth: 4 inches minimum
3. Curb Ramps: Provide at all road intersections and crosswalks[b]

Chart 3-3 Sidewalk and Planting Strip Standards								
Location	**Adjacent to Curb**	**Sidewalk Width**		**Sidewalk Clear Width****	**Planting Strip / Buffer Width**			
					With Street Trees		**Without Street Trees**	
		Minimum	**Recommended**		**Minimum**	**Recommended**	**Minimum**	**Recommended**
Concentrated Business Areas or High Pedestrian Volumes	No	10	10 to 15	10	6	6	3	5 to 6
Other Business Areas	No	5	6 to 8	5	6	6	3	5 to 6
	Yes	8	8 to 10	5	n/a		n/a	
Residential Areas on Public (VDOT) Roads	No	5		4	6		3	
	Yes	8		4	n/a		n/a	
Residential Areas on Private Roads	No	4*	5	4	4	6	2	2 to 4
	Yes	5	6	4	n/a		n/a	
*Sidewalks less than 5 feet in width shall have 5-foot-wide passing spaces located at reasonable intervals. ** Sidewalk clear width is the portion of sidewalk that excludes obstructions and any attached curb (AASHTO)								

Section 5 – Shared Use Paths

(A) Intent: Two-directional shared use paths are encouraged to be constructed in locations along public roads where pedestrians, bicyclists and other non-motorized users (and including motorized wheelchair users) can utilize the path either as a recreational amenity in itself or as a means to get from one location to another. Accessibility should be a fundamental consideration in the design and development of shared use paths.[c]

(B) General Standards (refer to current VDOT and AASHTO standards, as amended, for additional standards and detail)

1. Material: Hard, all-weather pavement surface

2. Width:
    a. 10 feet minimum with a 2-foot-wide graded area adjacent to both sides of the path[d]
    b. 8 feet minimum with a 2-foot-wide graded area adjacent to both sides of the path may be permitted when one or more of the following conditions are present[e]:
        i. Bicycle traffic is expected to be low, even on peak days or during peak hours,
        ii. Pedestrian use of the facility is not expected to be more than occasional,
        iii. There will be good horizontal and vertical alignment providing safe and frequent passing opportunities, and
        iv. During normal maintenance activities the path will not be subjected to maintenance vehicle loading conditions that would cause pavement edge damage.
3. Location: 5 feet minimum from edge of pavement or less with a suitable physical barrier between the path and the edge of the shoulder[f]
4. Grade: The path should generally match the grade of the road and should not exceed 5 percent except for short distances as referenced in the chart below:

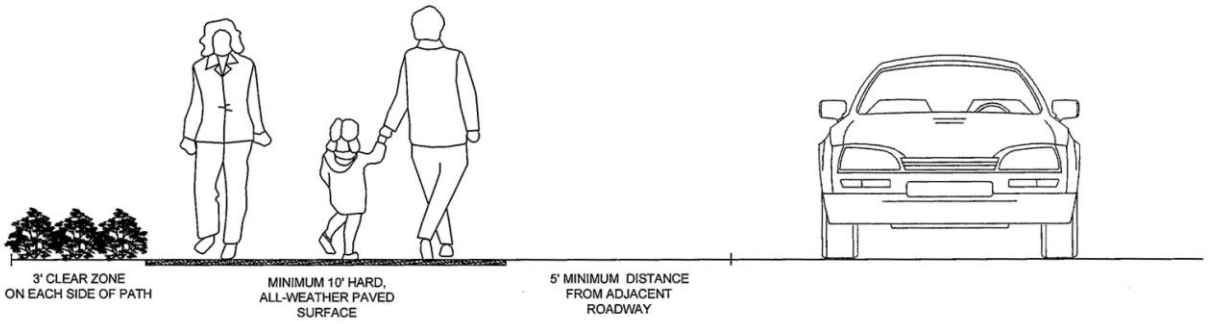
Chart 3-4 Shared Use Path Grades Permitted

Grade (percent)	**Maximum Length** (feet)
5-6	800
7	400
8	300
9	200
10	100
11+	50

Based on the 1999 AASHTO Guide for the Development of Bicycle Facilities[g]

5. Clear zone: 3 feet wide on either side of the path[h]
6. Curb Ramps: Provide at all road intersections and crosswalks[i]

Figure X – Shared Use Path Cross Section



Section 6 – Trails

(A) Intent: Private trails may be constructed in residential, commercial, industrial or other types of developments as recreational amenities or as a means to get from one location to another. Users may include pedestrians, bicyclists, equestrians, and persons in wheelchairs. These regulations are not intended for public trails which are typically located within public lands.

(B) General Standards

1. Hard Surface Trails
    a. Width: 4 feet wide, minimum
    b. Road Separation: 2 foot minimum grass strip or landscaped buffer

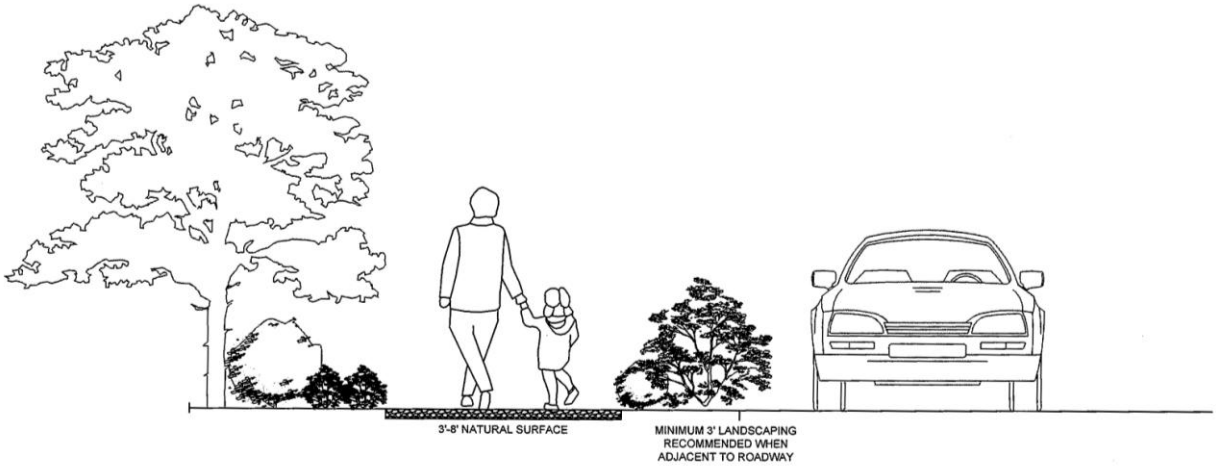
Figure X – Hard Surface Trail Cross Section

2. Natural Surface Trails
    a. Width: 3 feet wide, minimum, unless a narrower trail width is required by a state or federal agency.

b. Riparian Areas: Riparian vegetation shall be carefully considered in the planning and construction of trails in riparian areas. Wherever possible, the disturbance of existing vegetation shall be minimized and like species shall be planted to mitigate losses.

c. Road Separation: 2 foot minimum grass strip or landscaped buffer

Figure X – Natural Surface Trail Cross Section



3. Acceptable Trail Materials

Chart 3-5 Acceptable Trail Materials and Standards					
Material	**Hard Surface**	**Natural Surface**	**Minimum Thickness**	**Accessible**	**Appropriate Uses**
Asphalt	X		3 inches	yes	Pedestrian, Bicycle
Concrete	X		4 inches	yes	Pedestrian, Bicycle
Synthetic Rubber	X		3 inches	yes	Exercise/Fitness
Aggregate: 3/8" Natural Fines		X	6 inches	yes	Pedestrian, Bicycle, Equestrian
Aggregate: Road Mix (1/2" maximum)		X	6 inches	no	Pedestrian, Mountain Bicycle, Equestrian
Wood Chip		X	3 inches	no	Pedestrian, Mountain Bicycle, Equestrian
Compacted Soil		X	N/A	no	Pedestrian, Bicycle, Equestrian
Grass		X	N/A	no	Pedestrian, Mountain Bicycle, Equestrian

4. Stairs
    a. Stairs may be utilized to climb trails with steeper grades due to varying topography. The material used to construct stairs shall match or complement the trail type. For example, flagstone steps would complement a gravel trail or wooden railroad ties would complement a wood chip trail.
    b. A handrail may be installed adjacent to the stairs to assist hikers in climbing steep terrain.
5. Easements
    a. Access easements shall be recorded with a width five feet greater than the trail width.

Section 7 – Bicycle Accommodations

(A) Applicable regulations for bicycle accommodations:

1. Current VDOT standards, as amended
2. AASHTO Guide for the Development of Bicycle Facilities, as amended
3. Regional bikeway plans, as amended, available from the Roanoke Valley Alleghany Regional Commission and the Roanoke Valley Area Metropolitan Planning Organization

Section 8 – Private Roads

(A) Intent

1. The intent of this section is to provide adequate standards for Roanoke County private roads. Such roads may be provided only in selected urban residential developments including the Cluster Subdivision Option and the Planned Residential Development District. Private roads may also be permitted in locations identified by the Zoning Ordinance.

2. For related topics not covered in this section, refer to other County, State or Federal regulations.

(B) Definitions

1. *Alley*: An open way that affords a service (i.e. garbage collection, delivery, mail) means of access to an abutting property, but is not maintained by any local, state, or federal government. (Roanoke County Subdivision Ordinance and Zoning Ordinance) Alleys may also contain underground utilities.

2. *Driveway:* A private roadway providing access for vehicles to a parking space, garage, dwelling, or other structure. (Roanoke County Zoning Ordinance) A driveway is intended to provide access to no more than two dwelling units.

3. *Easement:* A right expressed in recorded writing, given by the owner of land to another party of specific limited use of that land (i.e., access, pedestrian, greenway, drainage, water, sewer, public utility). (Roanoke County Subdivision Ordinance)

4. *Plat, Final:* The plat of a proposed subdivision of land that has been preliminarily approved and signed by the agent as a preliminary plat, subsequently recorded or to be recorded with the Clerk's Office. (Roanoke County Subdivision Ordinance)

5. *Private Street/Road*: A vehicular way owned, operated, provided, and maintained by an individual, developer, homeowners' association, or any other entity other than a local, state, or federal government. (Roanoke County Subdivision Ordinance) A private road is intended to provide access to three or more dwelling units.

6. *Right-of-Way:* A legally established area or strip of land on which an irrevocable public right of passage has been or is to be recorded, and which may be occupied or intended to be occupied by a street, utility service, water main, sanitary or storm sewer main, or other similar use. (Roanoke County Subdivision Ordinance)

7. *VDOT:* The Virginia Department of Transportation (Roanoke County Subdivision Ordinance)

(C) Design

1. New private roads shall be designed to connect to Local Access Roads or Collectors and shall be designed to provide access to each residential lot.
2. Shoulder and Ditch Section Requirements.
    a. Intent. Shoulder and ditch sections are intended primarily for Planned Residential Developments characterized by larger residential lots (generally ¼ acre or greater) that may have longer driveways that allow parking for several vehicles. Only in rare instances would residents or guests park along the shoulder of a private road.
    b. Parking. If shoulders will be frequently utilized for parking, each shoulder shall measure four feet in width[j] and shall be constructed of either stone or bituminous pavement. Parking is not recommended along road sections with grades greater than 15 percent.

Chart 3-6 Shoulder and Ditch Standards			
Projected Traffic Volume (ADT)^	**Travelway Width** (pavement only)	**Roadway Width** (including shoulders)	~~**Maximum Grade*** (%)~~
Up to 30	14[k]	18[l]	~~17*~~
31-400	16[m]	20[n]	~~17*~~
401-600	18[o]	22[p]	~~17*~~
Over 600	Refer to current VDOT standards, as amended		
Referenced Standards: AASHTO Very Low Rural, 15-40MPH; AASHTO Very Low Local in Urban Areas, 2 or less du/acre; AASHTO Mountainous Terrain			

~~* Variations to grades may be approved by Roanoke County where evidence is provided by the applicant that steeper grades are necessary and can accommodate fire and emergency vehicles. Grade variations may range from between 17 and 20 percent. The length of that portion of the roadway shall not exceed 100 feet and the sections immediately preceding and proceeding that portion of roadway for a distance of 200 feet on both sides shall have grades not greater than 15 percent. This exception shall not be applied at fire hydrant locations.~~

^ To find the Average Daily Trip Generation (ADT) for a proposed land use, refer to the Institute of Transportation Engineers (ITE) Manual, as amended.

3. Curb and Gutter Section Requirements.
    a. Intent. Curb and gutter sections are intended for both Cluster and Planned Residential Development residential neighborhoods that are densely developed with small lot sizes (generally ¼ acre or less).
    b. Parking. Residential lots may have driveways spaced closely together that are shorter in length, allowing for parking of between two and four vehicles in the driveway. ~~Frequent on-street parking and/or parking in separate off-street parking spaces designated for overflow parking should~~

~~be carefully considered in the design of the neighborhood.~~ One-half (1/2) parking space shall be provided for each dwelling unit. Any fraction equaling or exceeding one-half (1/2) shall be construed as requiring one (1) full parking space. Parking spaces may be located off-street in a marked space or on-street in compliance with Chart 3-7., Curb and Gutter Standards. Parking is not recommended along road sections with grades greater than 15 percent.

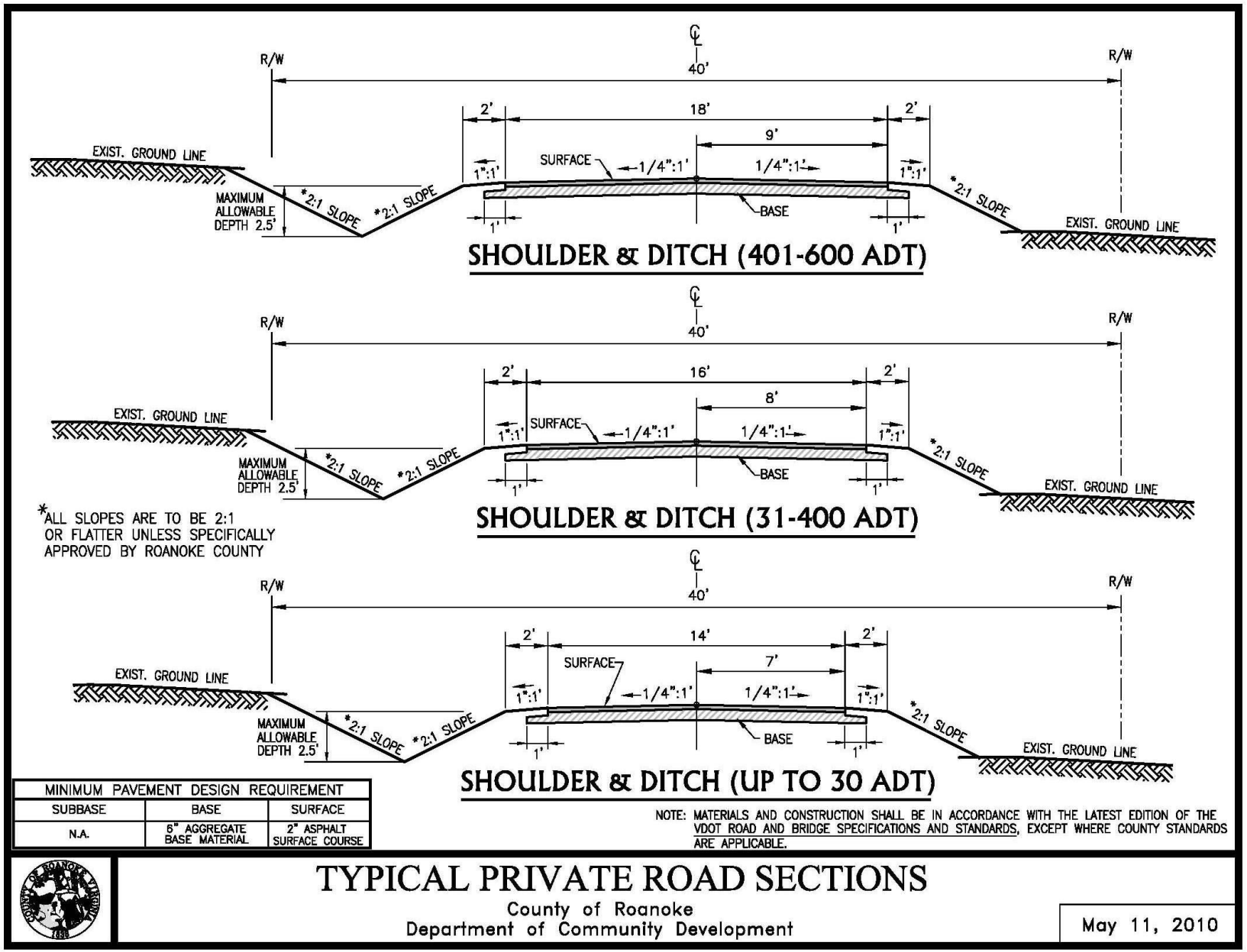
c. Curb and Gutter. Use CG-6, CG-7 or roll-top curb. See 5(e) Curb and Gutter Design for additional information.

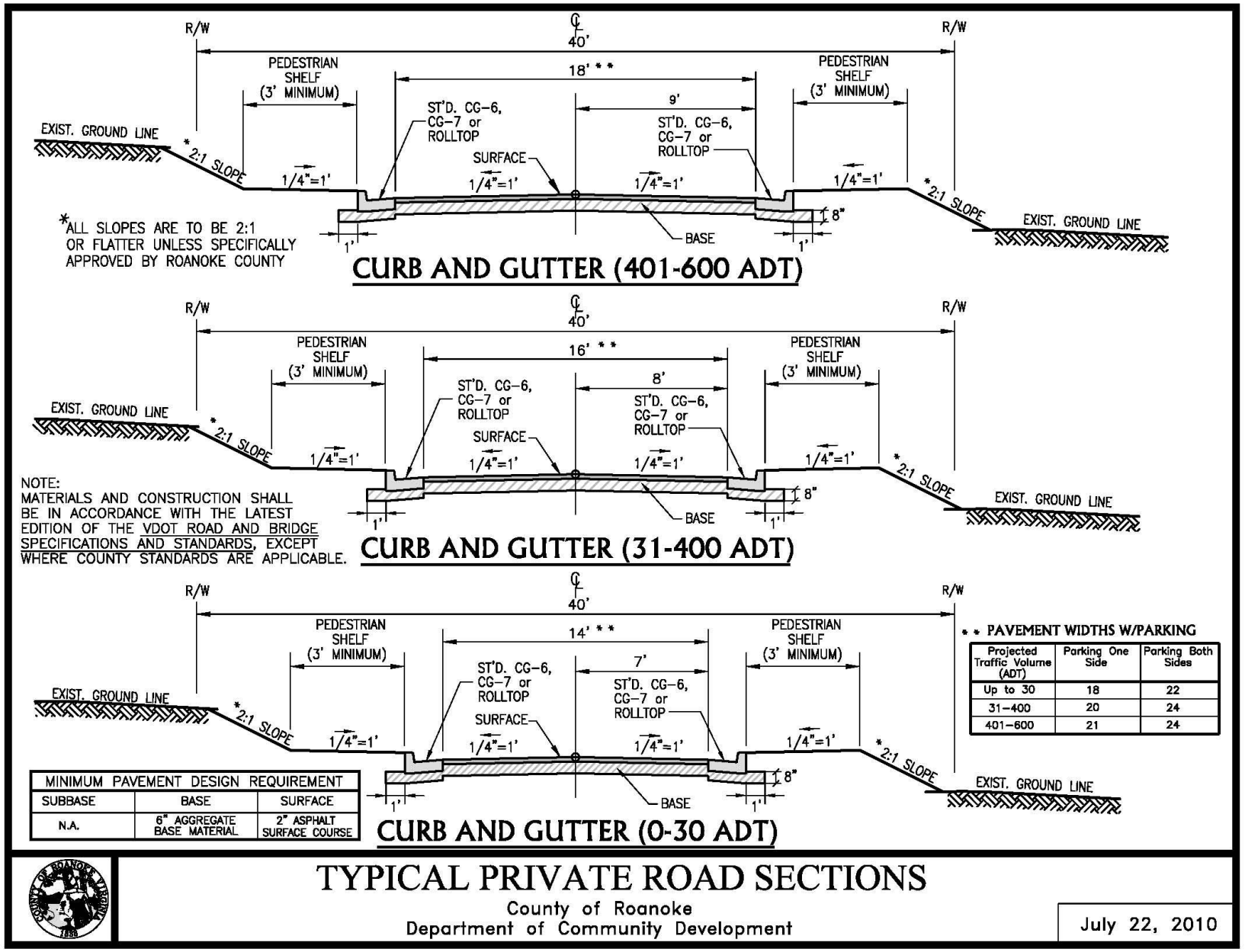
Chart 3-7 Curb and Gutter Standards

Projected Traffic Volume (ADT)^	**Pavement Widths Only**			~~**Maximum Grade***~~ ~~(%)~~
	No Parking	**Parking One Side**	**Parking Both Sides**	
Up to 30	14	18	22	~~17*~~
31-400	16	20	24	~~17*~~
401-600	18	21	24	~~17*~~
Over 600	Refer to current VDOT standards, as amended			
Referenced Standards: AASHTO Very Low Rural, 15-40MPH				

~~* Variation to grades may be approved by Roanoke County where evidence is provided by the applicant that steeper grades are necessary and can accommodate fire and emergency vehicles. Grade variations may range from between 17 and 20 percent. The length of that portion of the roadway shall not exceed 100 feet and the sections immediately preceding and proceeding that portion of roadway for a distance of 200 feet on both sides shall have grades not greater than 15 percent. This exception shall not be applied at fire hydrant locations.~~

^ To find the Average Daily Trip Generation (ADT) for a proposed land use, refer to the Institute of Transportation Engineers (ITE) Manual, as amended.


R/W
40'
R/W
2'
18'
2'
9'
EXIST. GROUND LINE
SURFACE
1/4":1'
1/4":1'
1":1'
1":1'
MAXIMUM ALLOWABLE DEPTH 2.5'
*2:1 SLOPE
*2:1 SLOPE
BASE
1'
1'
*2:1 SLOPE
EXIST. GROUND LINE
SHOULDER & DITCH (401-600 ADT)
R/W
40'
R/W
2'
16'
2'
8'
EXIST. GROUND LINE
SURFACE
1/4":1'
1/4":1'
1":1'
1":1'
MAXIMUM ALLOWABLE DEPTH 2.5
*2:1 SLOPE
*2:1 SLOPE
BASE
1'
1'
*2:1 SLOPE
EXIST. GROUND LINE
*ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY ROANOKE COUNTY
SHOULDER & DITCH (31-400 ADT)
R/W
40'
R/W
2'
14'
2'
7'
EXIST. GROUND LINE
SURFACE
1/4":1'
1/4":1'
1":1'
1":1'
MAXIMUM ALLOWABLE DEPTH 2.5'
*2:1 SLOPE
*2:1 SLOPE
BASE
1'
1'
*2:1 SLOPE
EXIST. GROUND LINE
SHOULDER & DITCH (UP TO 30 ADT)
MINIMUM PAVEMENT DESIGN REQUIREMENT
SUBBASE
BASE
SURFACE
N.A.
6" AGGREGATE BASE MATERIAL
2" ASPHALT SURFACE COURSE
NOTE: MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS AND STANDARDS, EXCEPT WHERE COUNTY STANDARDS ARE APPLICABLE.
TYPICAL PRIVATE ROAD SECTIONS
County of Roanoke
Department of Community Development
May 11, 2010


R/W
℄
40'
PEDESTRIAN SHELF (3' MINIMUM)
18' * *
9'
ST'D. CG-6, CG-7 or ROLLTOP
SURFACE
EXIST. GROUND LINE
* 2:1 SLOPE
1/4"=1'
8"
BASE
1'
*ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY ROANOKE COUNTY
CURB AND GUTTER (401-600 ADT)
16' * *
8'
NOTE:
MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS AND STANDARDS, EXCEPT WHERE COUNTY STANDARDS ARE APPLICABLE.
CURB AND GUTTER (31-400 ADT)
14' * *
7'
* * PAVEMENT WIDTHS W/PARKING
Projected Traffic Volume (ADT) | Parking One Side | Parking Both Sides
Up to 30 | 18 | 22
31-400 | 20 | 24
401-600 | 21 | 24
MINIMUM PAVEMENT DESIGN REQUIREMENT
SUBBASE | BASE | SURFACE
N.A. | 6" AGGREGATE BASE MATERIAL | 2" ASPHALT SURFACE COURSE
CURB AND GUTTER (0-30 ADT)
TYPICAL PRIVATE ROAD SECTIONS
County of Roanoke
Department of Community Development
July 22, 2010

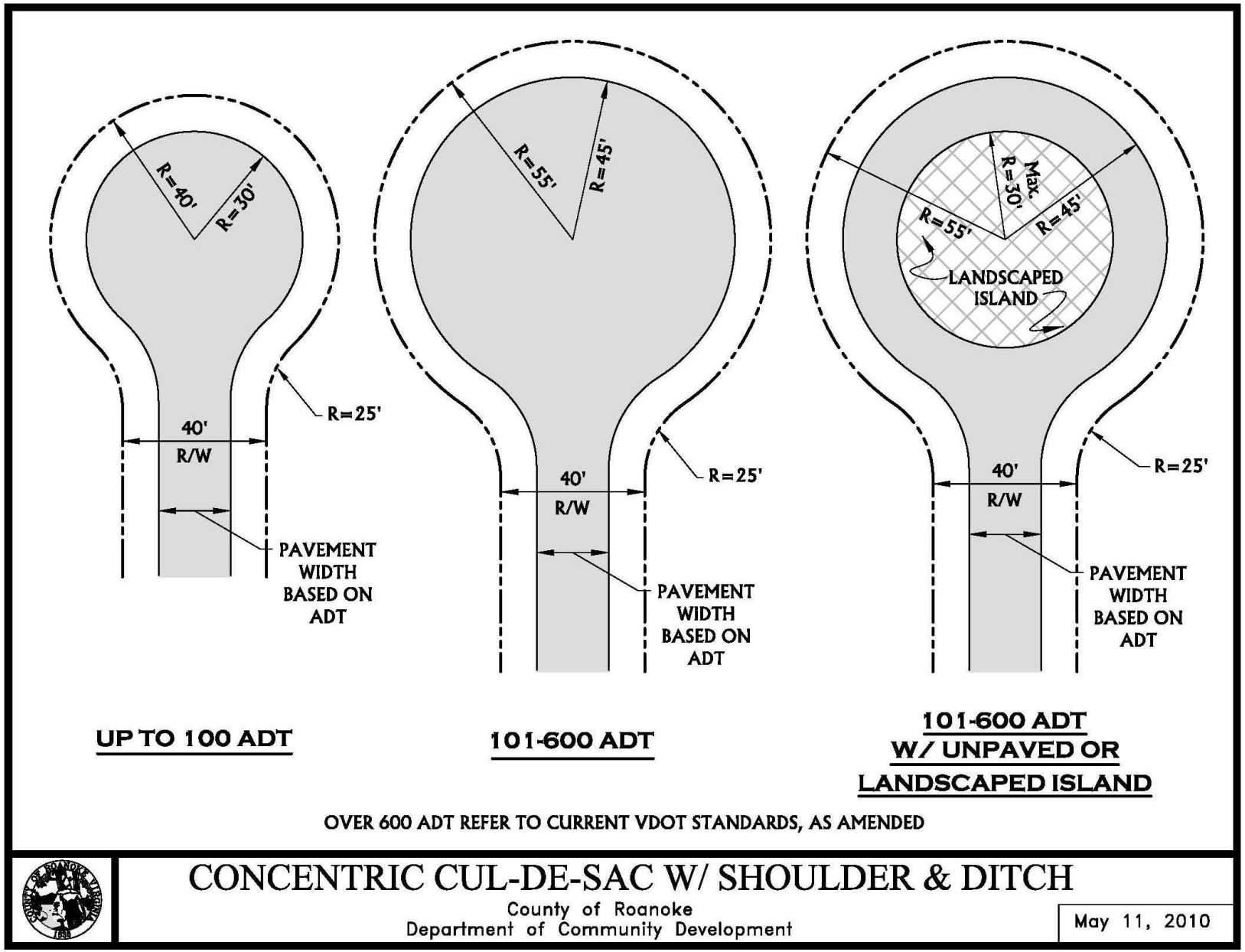
4. Turnarounds.[q] Every effort shall be made to provide through roads within a subdivision to minimize the need for dead end streets. If dead end streets must be used, turnarounds shall be required at the end of all private streets and alleys and are encouraged at the end of all shared driveways.

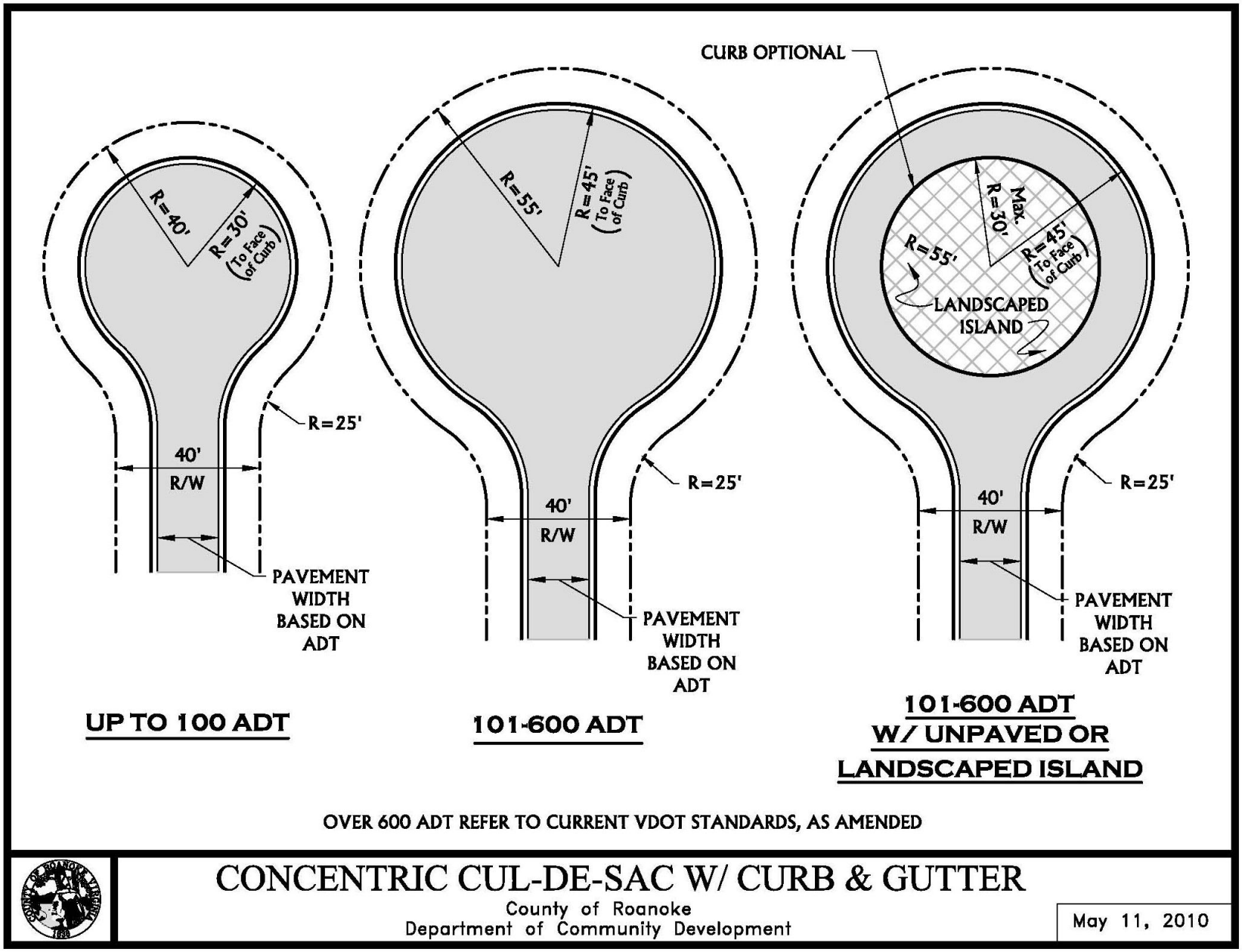
    a. Grade: Turnarounds should be as level as possible and shall have a maximum 5 percent centerline grade with a minimum cross slope of ¼ inch to 1 foot.[r]

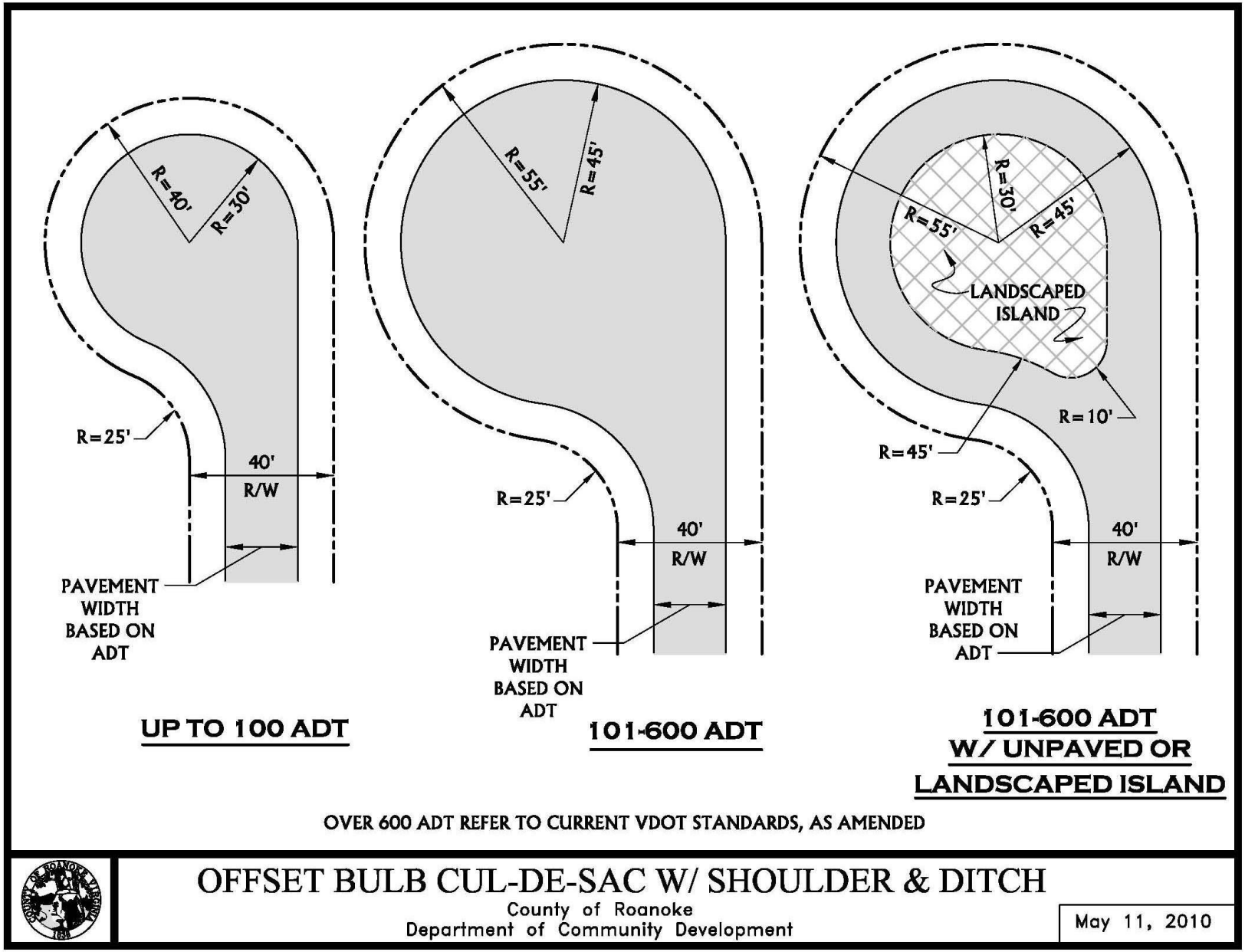
    b. Landscaped Islands: To reduce impervious area, curbed or un-curbed landscaped islands may be permitted within 45-foot radius or larger cul-de-sacs. The landscaped area shall have a maximum radius of 30 feet and a minimum 4-foot-wide concrete raised median strip (VDOT MS-1[s]) shall be located along the edge of the island. Bioretention areas may be permitted in such islands.

    c. Cul-de-sac Parking: To allow access for solid waste collection and other delivery vehicles, parking shall not be permitted in cul-de-sacs with landscaped islands. Parking shall not be permitted on cul-de-sacs with an edge-of-pavement or a face-of-curb radius less than 45 feet. Parking shall be permitted on cul-de-sacs with an edge-of-pavement or a face-of-curb radius of 45 feet or greater.[t]

    d. Alternative Turnaround Parking: Parking shall not be permitted in T-Type or Branch-Type Turnarounds.


R=40'
R=30'
40'
R/W
R=25'
PAVEMENT
WIDTH
BASED ON
ADT
UP TO 100 ADT
R=55'
R=45'
40'
R/W
R=25'
PAVEMENT
WIDTH
BASED ON
ADT
101-600 ADT
Max.
R=30'
R=55'
R=45'
LANDSCAPED
ISLAND
40'
R/W
R=25'
PAVEMENT
WIDTH
BASED ON
ADT
101-600 ADT
W/ UNPAVED OR
LANDSCAPED ISLAND
OVER 600 ADT REFER TO CURRENT VDOT STANDARDS, AS AMENDED
CONCENTRIC CUL-DE-SAC W/ SHOULDER & DITCH
County of Roanoke
Department of Community Development
May 11, 2010


CURB OPTIONAL
R=40'
R=30'
(To Face of Curb)
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
UP TO 100 ADT
R=55'
R=45'
(To Face of Curb)
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
101-600 ADT
Max. R=30'
R=55'
R=45'
(To Face of Curb)
LANDSCAPED ISLAND
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
101-600 ADT W/ UNPAVED OR LANDSCAPED ISLAND
OVER 600 ADT REFER TO CURRENT VDOT STANDARDS, AS AMENDED
CONCENTRIC CUL-DE-SAC W/ CURB & GUTTER
County of Roanoke
Department of Community Development
May 11, 2010


R=40'
R=30'
R=25'
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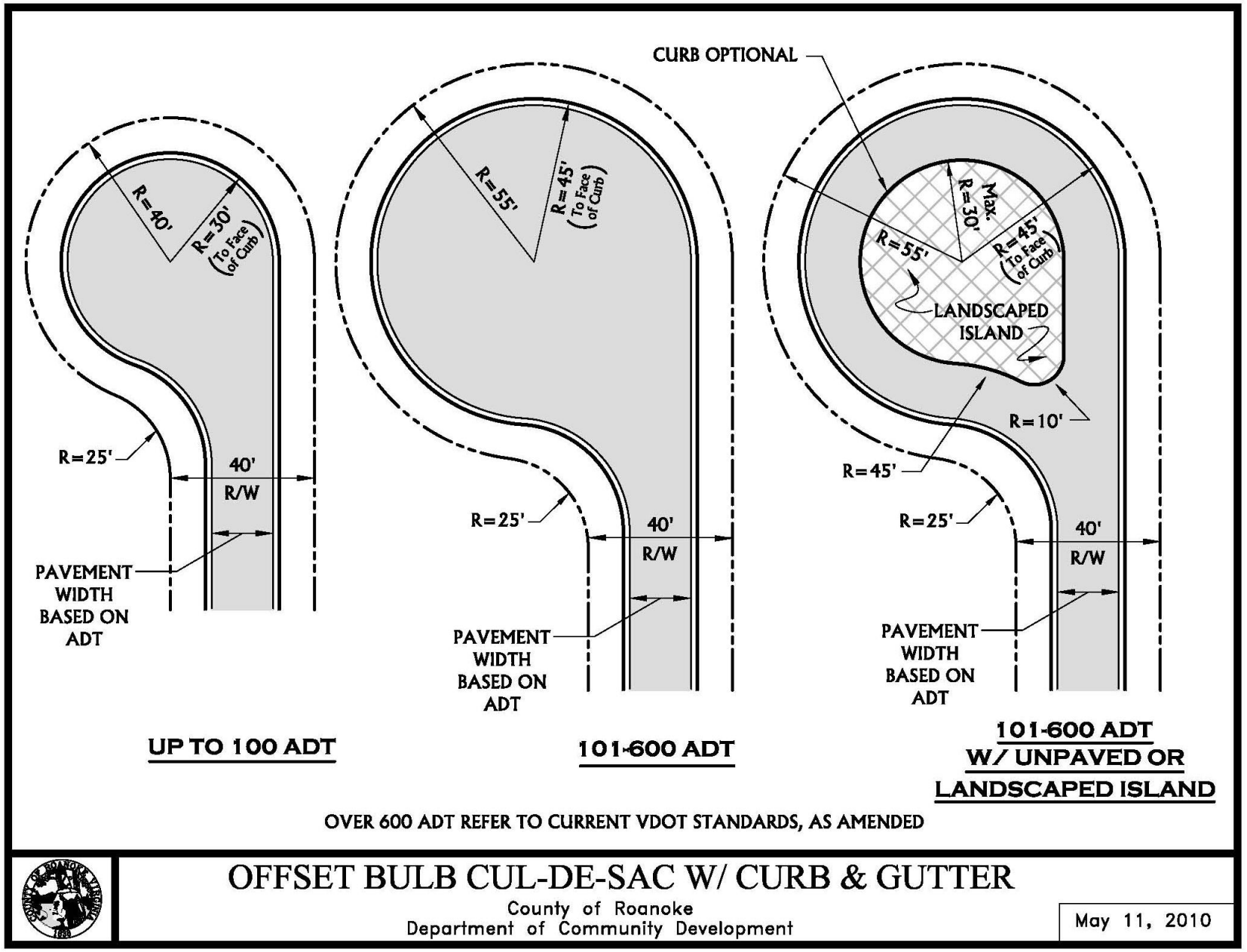
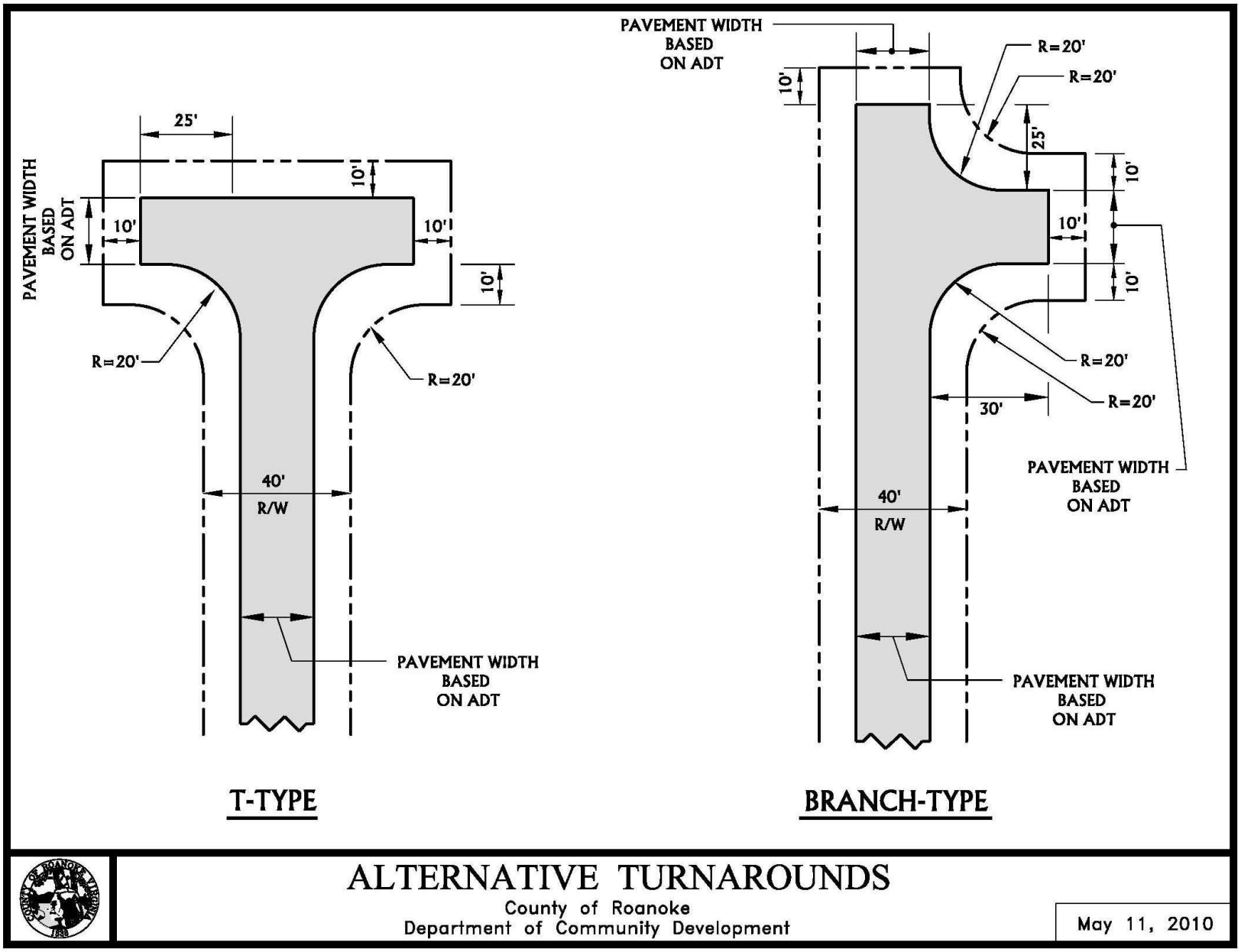
R/W
PAVEMENT WIDTH BASED ON ADT
UP TO 100 ADT
R=55'
R=45'
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
101-600 ADT
R=30'
R=55'
R=45'
LANDSCAPED ISLAND
R=10'
R=45'
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
101-600 ADT W/ UNPAVED OR LANDSCAPED ISLAND
OVER 600 ADT REFER TO CURRENT VDOT STANDARDS, AS AMENDED
OFFSET BULB CUL-DE-SAC W/ SHOULDER & DITCH
County of Roanoke
Department of Community Development
May 11, 2010


CURB OPTIONAL
R=40'
R=30'
(To Face of Curb)
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
UP TO 100 ADT
R=55'
R=45'
(To Face of Curb)
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
101-600 ADT
R=30'
Max.
R=55'
R=45'
(To Face of Curb)
LANDSCAPED ISLAND
R=10'
R=45'
R=25'
40'
R/W
PAVEMENT WIDTH BASED ON ADT
101-600 ADT W/ UNPAVED OR LANDSCAPED ISLAND
OVER 600 ADT REFER TO CURRENT VDOT STANDARDS, AS AMENDED
OFFSET BULB CUL-DE-SAC W/ CURB & GUTTER
County of Roanoke
Department of Community Development
May 11, 2010


PAVEMENT WIDTH BASED ON ADT
25'
10'
10'
10'
10'
R=20'
R=20'
40' R/W
PAVEMENT WIDTH BASED ON ADT
T-TYPE
PAVEMENT WIDTH BASED ON ADT
10'
R=20'
R=20'
25'
10'
10'
10'
R=20'
R=20'
30'
40' R/W
PAVEMENT WIDTH BASED ON ADT
PAVEMENT WIDTH BASED ON ADT
BRANCH-TYPE
ALTERNATIVE TURNAROUNDS
County of Roanoke
Department of Community Development
May 11, 2010

5. ~~Refer to current VDOT standards, as amended, for the following:~~ Design Elements:

   a. Alleys. Alleys shall be owned and maintained by the Homeowners' Association, and notes to this effect shall be indicated on the final plat.

      i. One-way alley[u]:

         (A) Minimum Width: 12 feet wide paved width

         (B) Minimum Right-of-Way Width: 20 feet wide[v]

      ii. Two-way alley:

         (A) Minimum Width: 16 feet wide paved width

         (B) Minimum Right-of-Way Width: 24 feet wide

   b. Bridge and Culvert Design Criteria. Current VDOT standards[w], as amended. ~~New bridge design within a private road shall at a minimum meet AASHTO standard specifications for highway bridges. Additionally, bridge vehicle load limits shall be established by a Professional Engineer and signs noting this limit shall be posted at each end of the bridge.~~

   c. Clear Zone. Current VDOT standards[x], as amended.

   d. Compaction. Current VDOT standards, as amended.

   e. Curb and Gutter Design. Current VDOT standards, as amended. Use CG-6, CG-7 or roll-top curb.

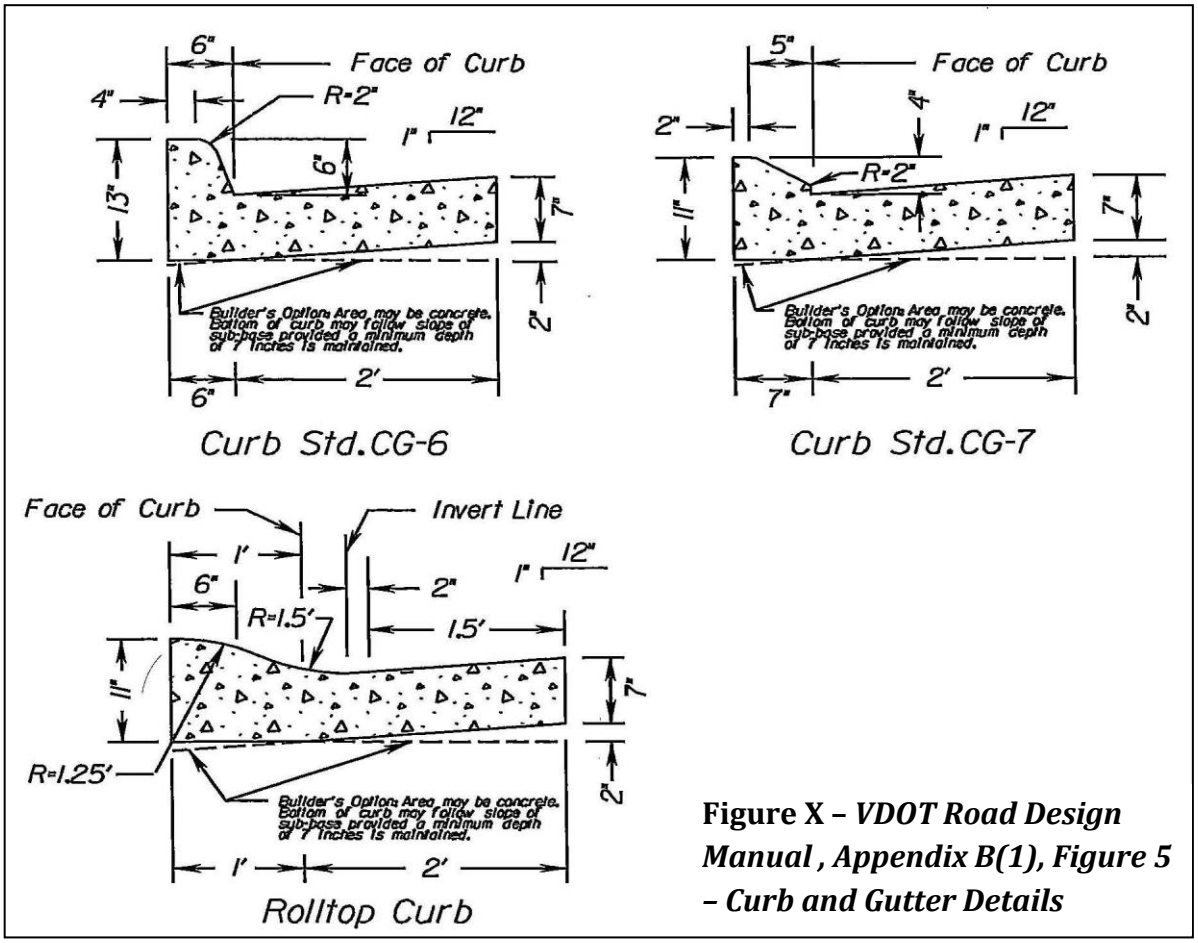


Figure X – *VDOT Road Design Manual , Appendix B(1), Figure 5 – Curb and Gutter Details*

i. Curb and gutter may be precast of Class A4 hydraulic cement concrete or cast in place using Class A3 hydraulic cement concrete.[y]

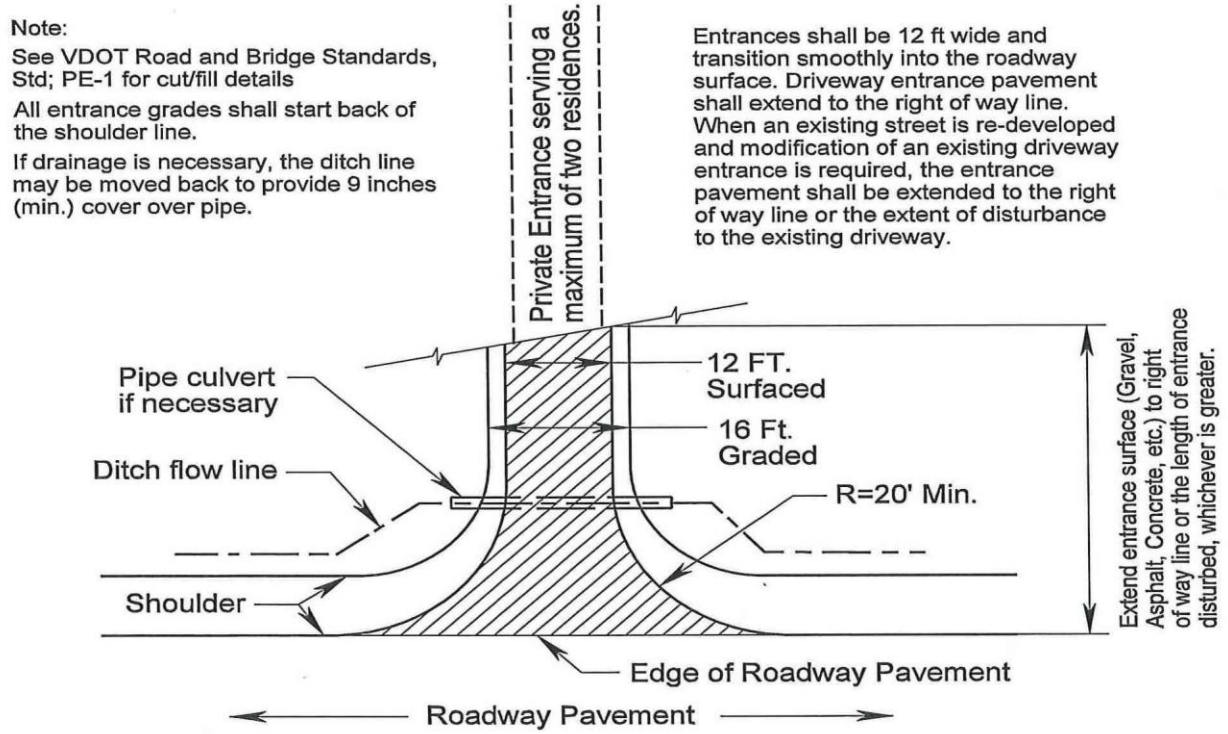
ii. When used with stabilized, open-graded drainage layers, the bottom of the curb and gutter shall be constructed parallel to the slope of the sub-base courses and to the depth of the pavement but not less than the thickness shown.[z]

f. Drainage. The crown, or cross-slope, of the road's surface shall be 2 percent (1/4 inch to 1 foot) in tangent sections to convey run-off to the shoulders and ditches. These ditches should accommodate the design runoff in a manner that assures the safety of motorists and minimizes future maintenance, damage to adjacent properties, and adverse environmental, or aesthetic effects. Refer to current VDOT Road Design Manual[aa] and VDOT Drainage Manual ~~Subdivision Street Design Guide~~ standards, as amended, for additional standards.

g. Driveways[bb]. In the interest of assuring adequate, convenient, and safe access to private roads, driveway landings shall not exceed ten percent

for a length of 30 feet[cc], measuring from the private road edge of pavement. At all driveway entrances, standard entrance gutter (Std. CG-9B or CG-9D) shall be used with Standard CG-6 or CG-7 curb and gutter. A special design entrance gutter shall be used when rolltop curb is utilized.[dd] See the graphic below for additional detail.

Figure X – *VDOT Road Design Manual, Appendix B(1), Figure 9 – Private Entrance*



h. Grade.

i. To allow for fire and rescue access the maximum grade shall comply with current VDOT standards, as amended[ee] at private driveway entrances and at fire hydrant locations.

ii. At all other locations the maximum grade shall not exceed 17 percent unless a Design Exception is approved.

iii. A Design Exception request may be submitted to the Director of Community Development to increase the maximum grade for a certain length of private road only if one or more of the following circumstances are present:

1. The length of road fronts ½ acre lots or larger;

2. The length of road is 150 feet or shorter;

3. The length of road has a horizontal curvature of 5 degrees or less for a 150-foot tangent section;

4. Environmental constraints such as wetlands, FEMA floodways or County-designated floodways are located in the immediate vicinity and will not be impacted because of the Design Exception; or

5. All dwelling units at and beyond the limit of the Design Exception are sprinkled.

An alternative route to the Design Exception request shall be engineered. The two routes shall be compared to show that the Design Exception route presents fewer negative impacts than the alternative route. The Director of Community Development in consultation with the Fire and Rescue Department shall make the final decision regarding the Design Exception.

i. Green Shoulders. Current AASHTO standards, as amended.

j. Guardrail. Current VDOT standards[ff], as amended.

k. Horizontal and Vertical Controls. Current AASHTO standards, as amended (see tables below). All private roads shall be designed with a normal crown section.

Chart 3-8 Design Controls for Stopping Sight Distance and for Crest Vertical Curves

Design Speed (mph)	Stopping Sight Distance (ft)	Rate of Vertical Curvature, *K*[a]	
		Calculated	Design
20	115	6.1	7
25	155	11.1	12
30	200	18.5	19

Rate of vertical curvature, *K,* is the length of curve per percent algebraic difference in intersecting grades (*A*). $K = L/A$
Based on the 2004 AASHTO Green Book[gg]

Chart 3-9 Design Controls for Sag Vertical Curves			
Design Speed (mph)	**Stopping Sight Distance (ft)**	**Rate of Vertical Curvature, *K*[a]**	
		Calculated	**Design**
20	115	16.5	17
25	155	25.5	26
30	200	36.4	37
Rate of vertical curvature, *K,* is the length of curve (m) per percent algebraic difference intersecting grades (*A*). *K = L/A* *Based on the 2004 AASHTO Green Book*[hh]			

Chart 3-10 Minimum Radii for Low-Speed Urban Streets			
Design Speed	**20 mph**	**25 mph**	**30 mph**
Radius (ft)	107	198	333
Based on the 2004 AASHTO Green Book[ii]			

k. Intersections[jj] (Excluding Alley Intersections)

i. Cross Road Grade.[kk] The maximum difference between the pavement cross slope and the approach road grade shall not exceed 8 percent at stop intersections or 4 percent at continuous-movement intersections. A landing having a minimum length of 50 feet and a maximum vertical grade of 5 percent shall be provided at each intersection. (Current VDOT Road Design Manual and Subdivision Street Design Guide as amended)

ii. Angles. Streets should intersect at right angles; however, intersecting angles between 60 and 90 degrees are permitted. (Current VDOT Subdivision Street Design Guide, as amended)

iii. Spacing. Offset intersections are ~~discouraged~~ not allowed. Intersections or intersecting streets on the same side or opposite side shall be spaced at a minimum of 200 feet and this distance shall be adjusted upward based on upstream and downstream intersection turning movements. (Based on current VDOT Subdivision Street Design Guide, as amended)

iv. Minimum Radius. For skew intersections the radius shall not be less than 25 feet for the acute angle and 30 feet for the obtuse angle of the intersection street. (Current VDOT Subdivision Street Design Guide, as amended)

v. Visibility. At intersections, a minimum clear sight triangle shall be maintained as illustrated in the Intersection Design graphic below.

It shall be the responsibility of the developer/Homeowners' Association to maintain a clear sight triangle at all times.

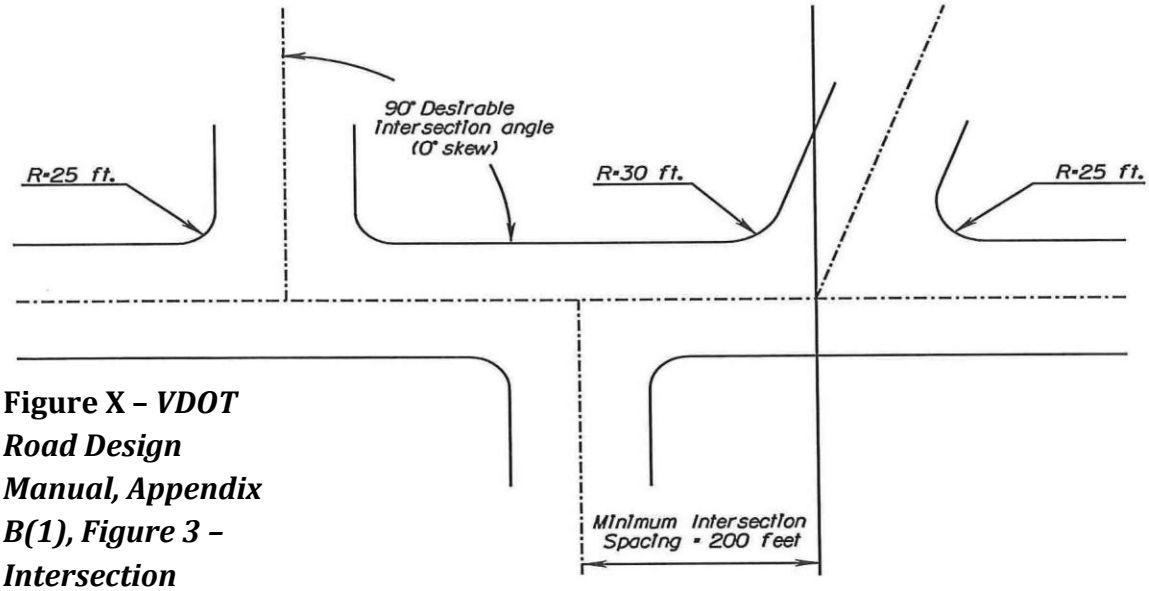


Figure X – *VDOT Road Design Manual, Appendix B(1), Figure 3 – Intersection Design*

l. Lighting[ll]. The installation, maintenance and operating expenses of lighting shall be provided by and at the sole expense of the developer or Homeowners' Association. ~~Lighting shall comply with Zoning Ordinance Section 30-94, Exterior Lighting.~~

m. One-Way, One-Lane Streets. One-way streets shall meet the dimensional requirements below and shall have two access points. Horizontal and vertical curvature shall meet the requirements stated above in Section 5k, Horizontal and Vertical Controls. Parking shall not be permitted along one-way, one-lane streets.

Chart 3-11 One-Way, One-Lane Street Standards				
Projected Traffic Volume (ADT)^	**Shoulder and Ditch**		**Curb and Gutter**	
	Travelway Width (pavement only)	**Roadway Width** (including shoulders)	**Pavement Width**	~~**Maximum Grade*** (%)~~
Up to 600	12	16	12 ~~10~~	~~17~~
Based on the 2004 AASHTO Green Book[mm]				

~~* Variations to grades may be approved by Roanoke County where evidence is provided by the applicant that steeper grades are necessary and can accommodate fire and emergency vehicles. Grade variations may range from between 17 and 20 percent. The length of that portion of the roadway shall not exceed 100 feet and the sections immediately preceding and proceeding that portion of roadway for a distance of 200 feet on both sides shall have grades not greater than 15 percent. This exception shall not be applied at fire hydrant locations.~~

^ To find the Average Daily Trip Generation (ADT) for a proposed land use, refer to the Institute of Transportation Engineers (ITE) Manual, as amended.

n. Parking. Parking is not recommended along road sections with grades greater than 15 percent. In any location where parking is prohibited, "No Parking" signs shall be installed. Off-street parking spaces are permitted in the private road right-of-way to provide overflow and visitor parking. To allow access for solid waste collection and other delivery vehicles, parking shall not be permitted in cul-de-sacs with landscaped islands.

o. Pavement Design. Current VDOT standards, as amended. All private roads shall be designed with a normal crown section.

p. Pedestrian Shelf. Where curb and gutter is used, a ¼ inch per foot (two percent) graded area, a minimum three feet in width, shall be provided behind the back of the curb[nn] to transition from steeper adjacent grades. The pedestrian shelf is intended for pedestrian use and may include sidewalks and other related pedestrian amenities.

q. Plat Covenant Language. Add the following note to each page of the plat of subdivision:

> "The road serving this lot is private and its maintenance, including snow removal, is not a public responsibility. It shall not be eligible for acceptance into the state secondary system for maintenance until such time as it is constructed and otherwise complies with all requirements of the Virginia Department of Transportation for the addition of subdivision streets current at the time of such request. Any costs required to cause this street to become eligible for addition into the state system shall be provided with funds other than those administered by the Virginia Department of Transportation or Roanoke County."

r. Right-of-Way. ~~Additionally, a minimum width of 40 feet shall be provided.~~ Minimum 30 foot width required. See current VDOT standards[oo], as amended, for additional information.

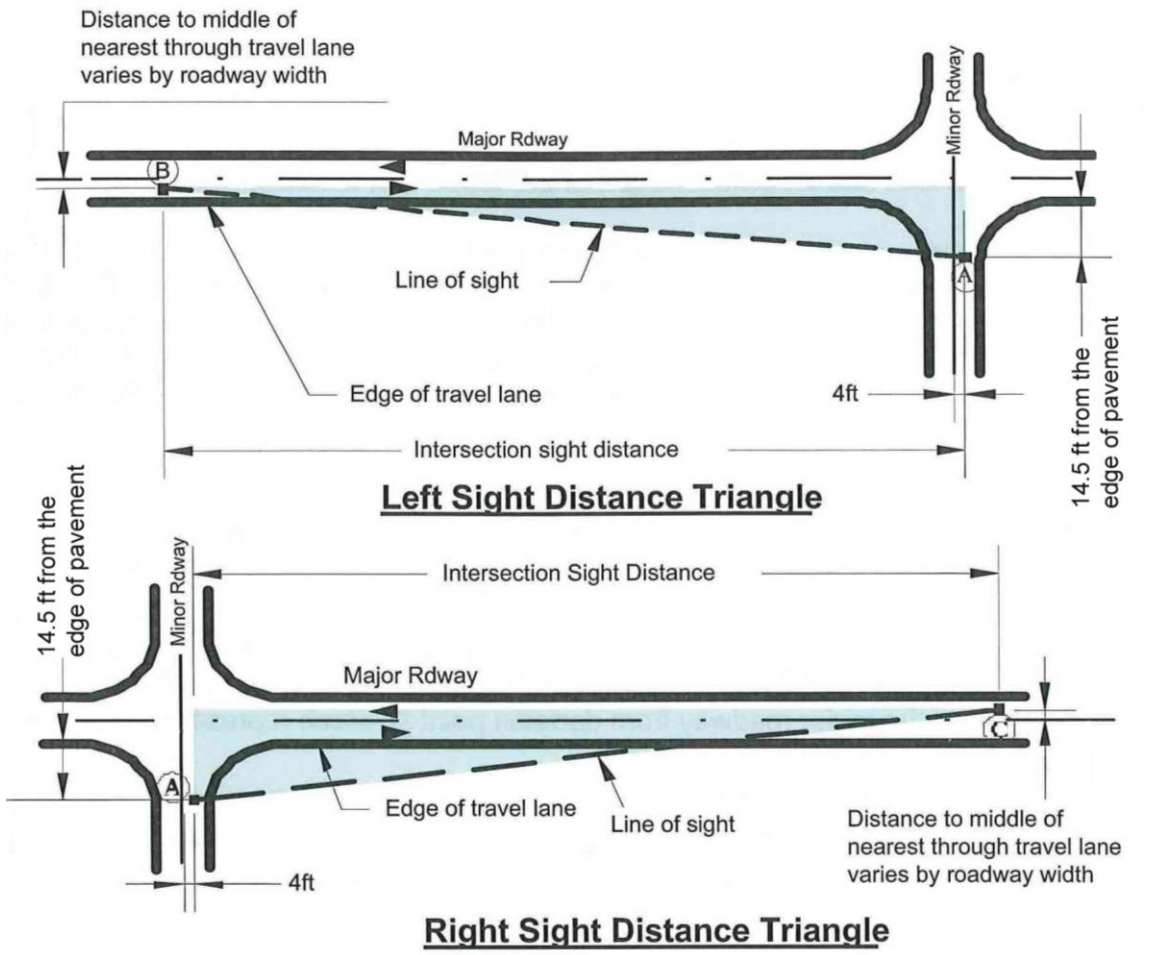
s. Sight Distance to include Stopping Sight Distance, Intersection Sight Distance and Sight Distance Triangles (see AASHTO tables and VDOT graphic below).

Chart 3-12 Stopping Sight Distance on Grades						
Design Speed (mph)	**Stopping Sight Distance (ft)**					
	Downgrades			**Upgrades**		
	3%	**6%**	**9%**	**3%**	**6%**	**9%**
20	116	120	126	109	107	104
25	158	165	173	147	143	140
30	205	215	227	200	184	179
Based on the 2004 AASHTO Green Book[pp]						

Chart 3-13 Design Controls for Stopping Sight Distance and for Crest and Sag Vertical Curves			
Initial Speed (mph)	**Design stopping sight distance (ft)**	**Rate of vertical curvature, *K*[a] (ft/%)**	
		Crest	**Sag**
20	115	7	17
25	155	12	26
30	200	19	37
Rate of vertical curvature, *K,* is the length of curve per percent algebraic difference in the intersecting grades (i.e., *K = L/A)* *Based on the 2004 AASHTO Green Book*[qq]			

Chart 3-14 Design Intersection Sight Distance - Case B1 – Left Turn from Stop			
Design Speed (mph)	**Stopping Sight Distance (ft)**	**Intersection Sight Distance for Passenger Cars**	
		Calculated (ft)	**Design (ft)**
20	115	220.5	225
25	155	275.6	280
30	200	330.8	335
Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3 percent or less. For other conditions, the time gap must be adjusted and required sight distance recalculated. *Based on the 2004 AASHTO Green Book*[rr]			

Figure X – *VDOT Road Design Manual, Appendix B(1), Figure 2 – Sight Distance Triangle*



t. Shared Driveways. Shared driveways shall be permitted to serve no more than two houses. Shared driveways shall be created using access easements measuring 20 feet in width. Access easements shall be shown and noted on the Final Plat.

u. Sidewalks. Sidewalks are encouraged to be located along private roads to encourage residents and their guests to walk in a designated pedestrian area separated from automobiles. Sidewalks shall be permitted within the right-of-way or within a public access easement and shall be maintained by the Homeowners' Association. Public access easements shall be shown and noted on the Final Plat. See Section 4, Sidewalks, for additional requirements.

v. Speed Control/Traffic Calming Design Features. Speed control design features such as speed bumps, speed humps, etc., shall not be installed unless approved by Roanoke County Community Development with input

from the staff of County Schools, County General Services, and Fire and Rescue Departments.

w. Standard Notes. Include a notation on the construction plans identifying the proposed private roads.

x. Stormwater Management Facilities. Entry to privately owned and maintained stormwater management facilities and accesses shall be provided per the latest County of Roanoke Stormwater Management Design Manual. An easement shall be provided to Roanoke County for access and maintenance of a stormwater management facility. Such easements shall be noted on the plat. See Section (D)1. Drainage Easements, for additional standards.

z. Traffic Control Devices and Signage. Each private road shall be identified with a street name sign at each intersection which shall be ~~distinguishable from public street signs~~. white with green lettering, per Roanoke County standards. Provide stop signs at entrance and interior intersections. Comply with the MUTCD Manual, as amended. Traffic signs and street name signs do not require sign permits. For all other signs, refer to Zoning Ordinance Section 30-93, Signs, to determine the need for a Sign Permit. Additional regulations:

i. Installation and Maintenance: The developer shall be responsible for purchasing, installing and maintaining all signs. When the private road is turned over to the Homeowners' Association it shall then be the responsibility of the Homeowners' Association to maintain all signs.

ii. Enforcement: The Roanoke County Police Department is unable to enforce traffic regulations on private roads. Parking enforcement shall be the responsibility of the owner of the private road or the Homeowners' Association.

iii. Maintenance of Traffic through Construction Areas: Refer to the MUTCD Manual, as amended.

aa. Trip Generation/Average Daily Trips (ADT). Refer to the Institute of Transportation Engineers (ITE) *Trip Generation* manual, as amended.

bb. Vertical Clearance Height. Private roads through forested areas or under other overhead obstructions must maintain proper clearance heights above the traveled way to allow passage of emergency vehicles. Tree

branches must be trimmed and maintained to obtain a minimum overhead clearance of 14 feet.

(D) Easements

1. *Drainage Easements*:

   a. The width and location of drainage and stormwater pond facility easements shall comply with the Stormwater Management Ordinance and Stormwater Design Manual, as amended.

   b. Private drainage easements shall be platted and dedicated to the homeowners' association for maintenance and notes to this effect shall be indicated on the final plat.

   c. Public drainage easements shall be platted and dedicated for public use.

2. *Sight Distance Easements:* Width and location to be determined by VDOT for public and private road intersections. For intersections of two or more private roads, dedicated right-of-way may be needed to preserve the line-of-sight. A sight distance easement may be an alternative to dedicated right-of-way.

3. *Water and Sewer Easements:* Width and location to be determined by the Western Virginia Water Authority or the Town of Vinton Department of Public Works depending upon the service provider.

4. *Public/Private Utility Easements:* Width and location to be determined by the appropriate utility company(ies)

(F) Public Services

1. *School Bus Service:* A written request shall be sent to the Operations Department of Roanoke County Public Schools for consideration of school bus service per Roanoke County Public Schools Administration requirements. If the proposed design does not meet standards for school bus service, the final subdivision plat shall contain the following notation on each page of the plat of subdivision:

   "The proposed private streets do not meet the standards for school bus service and the Roanoke County School Board shall not be obligated to provide service on the private streets."

2. *Solid Waste:* To receive public solid waste collection, a Private Road Waiver shall be completed and signed prior to site plan/subdivision plan approval. If a Private Road Waiver is not completed, the homeowners and/or homeowners' association has the responsibility for addressing the collection of solid waste.

3. *Fire and Rescue Service*: A representative of the Fire and Rescue Department shall review the design and location of all proposed private streets, and shall advise the applicant whether or not the proposed private streets meet the standards for emergency services.

(G) Process

1. *Plan Submittal Requirements:* Refer to the Roanoke County Land Development Procedures, as amended.

2. *Erosion and Sediment Control:* All land disturbing activities shall comply with the Roanoke County Erosion and Sediment Control Ordinance, as amended.

3. *Inspections:* A third-party inspector shall inspect private roads following the requirements below:

    a. Developer must contract with a licensed inspection firm certified to perform inspections not related to or affiliated with the developer or contractor;

    b. Inspection procedures, testing methodology, and frequency of inspections are completed in accordance with VDOT Materials Division's Manual of Instructions and the Virginia Department of Transportation Road and Bridge Specifications. Inspections include but are not limited to:

        ~~i. Completion of any construction surveying and staking;~~

        ~~ii.~~i. Completion of subgrade, prior to the placement of any ballast material;

        ~~iii.~~ii. Completion of ballast, prior to the placement of any top course of material; and

        ~~iv.~~iii. Completion of installation of road signs, installation of any appurtenant structures, and reseeding of disturbed area and slopes.

4. *Final Report:* At the completion of the road construction a report shall be submitted to Roanoke County Community Development by the developer which includes all material receipts, dates of inspection, work performed, changes or repairs ordered, inspection steps completed, certification of the results of inspection, and confirmation that the streets were built to the approved specifications and pavement design, signed, and stamped by a Virginia licensed Professional Engineer.

5. *As-built Drawings*: At the completion of the road construction the developer shall submit two copies of the certified as-built drawings ~~which may be legible~~

~~marked-up drawings, shall be submitted~~ to Roanoke County Community Development which shall provide one copy to the Roanoke County Fire Marshal.

6. *Turnover to Homeowners' Association:* To ensure that the Homeowners' Association does not receive substandard private roads, include the following notation on the plans:

   "Immediately prior to the turnover of the private roads to the Homeowners' Association, Roanoke County shall inspect the private roads and any defects shall be repaired by the responsible party before the turnover occurs."

7. *Maintenance:* A Homeowners' Association is required to be established to be responsible for all private roads, to include maintenance and upkeep of the private roads. The HOA shall also enforce parking restrictions.[ss]

[a] VDOT Road Design Manual, p. B(1)-31
[b] VDOT Road Design Manual, p. B(1)-27
[c] AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, p. 71
[d] VDOT Road Design Manual, p. B(1)-33; AASHTO Guide for the Development of Bicycle Facilities (1999) p. 35
[e] VDOT Road Design Manual, p. B(1)-33
[f] VDOT Road Design Manual, p. B(1)-33
[g] VDOT Road Design Manual, p. B(1)-35; AASHTO Guide for the Development of Bicycle Facilities (1999) p. 39
[h] VDOT Road Design Manual, p. B(1)-34
[i] VDOT Road Design Manual, p. B(1)-27
[j] VDOT Road Design Manual, p. A-57
[k] AASHTO Green Book, p. 384
[l] AASHTO Design of Very Low-Volume Roads, p. 18
[m] AASHTO Green Book, p. 384 (added 2 feet)
[n] AASHTO Design of Very Low-Volume Roads, p. 18 (added 2 feet)
[o] AASHTO Green Book, p. 384
[p] AASHTO Green Book, p. 384 (added 2 feet)
[q] Cul-de-sac dimensions per VDOT Road Design Manual, p. B(1)-24, B(1)-25
[r] City of Manassas (VA) Road Standards and Brian Blevins at VDOT; based on previous VDOT Standards
[s] VDOT Road and Bridge Standards, 2001, p. 202.02
[t] AASHTO Green Book p. 396
[u] VDOT Road Design Manual p. A-16
[v] AASHTO Green Book, p. 396
[w] VDOT Road Design Manual, p. B(1)-37
[x] VDOT Road Design Manual, p. B(1)-41
[y] VDOT Road Design Manual, p. B(1)-26
[z] VDOT Road Design Manual, p. B(1)-26
[aa] VDOT Road Design Manual, p. B(1)-38
[bb] VDOT Road Design Manual, p. B(1)-30
[cc] 30 foot length per Roanoke County Engineer
[dd] VDOT Road Design Manual, p. B(1)-28
[ee] VDOT Road Design Manual, p. B(1)7, B(1)8
[ff] VDOT Road Design Manual, p. B(1)-43
[gg] AASHTO Green Book, p. 272
[hh] AASHTO Green Book, p. 277
[ii] AASHTO Green Book, p. 151
[jj] VDOT Road Design Manual, p. B(1)-21 and 22
[kk] VDOT Road Design Manual, p. C-4 and G-35
[ll] VDOT Road Design Manual, p. B(1)-53
[mm] AASHTO Green Book, p. 396
[nn] VDOT Road Design Manual, p. B(1)-27
[oo] VDOT Road Design Manual, p. B(1)40
[pp] AASHTO Green Book, p. 115
[qq] AASHTO Green Book, p. 381
[rr] AASHTO Green Book, p. 661; VDOT Road Design Manual, p. B(1)-7 and C-31
[ss] City of Corona (CA) Public Works Department Private Street Standards